Please amend Figures 7 and 13 as follows:

"Referencing Nodes Location Table 702" is amended to "Referencing Nodes Location Table 704".

"Nonreferencing Nodes Location Table 704" is amended to "Nonreferencing Nodes Location Table 702".

REMARKS

Reconsideration of this application as amended is respectfully requested.

In the Office Action, claims 1-51 were pending. Claims 1-51 were rejected. Claims 4-19 and 31-51 were objected. In this response, no claim has been canceled. Claims 1, 3-4, 7-8, 15, 20, 27, 30-31, 33, 35-36, 40, and 47 have been amended to particularly point out and distinctly claim, in full, clear, concise, and exact terms, the subject matter which Applicant regards as his invention. Portions of the drawings have been amended. No new matter has been added.

CLAIM OBJECTIONS

Claims 4-19 and 31-51 have been objected to because of informalities. In view of the foregoing amendments, it is respectfully submitted that the objections have been overcome.

REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

The Examiner has rejected claims 27-30 and 32 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In view of the foregoing amendments, it is respectfully submitted that the rejections have been overcome.

REJECTIONS UNDER 35 U.S.C. § 101

The Examiner has rejected claims 1-19 and 31-51 under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter. It is respectfully submitted that it is well settled that computer implemented methods are patentable. The present invention as claimed is related to computer implemented methods for manipulating data in a novel way,

particularly, for garbage collection operations of a computer. Withdrawal of the rejections is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103

The Examiner has rejected claims 1-17, 19-23, 25, 26, 33-49 and 51 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,249,792 to Zwilling, et al., ("Zwilling"). Claims 18, 24, 27-32 and 50 are rejected under 35 U.S.C. §103(a) as being unpatentable over Zwilling, in view of U.S. Patent No. 5,963,962 to Hitz, et al. ("Hitz").

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). (Manual of Patent Examining Procedure (MPEP) ¶ 2143.03).

It is respectfully submitted that claims 1-51 include limitations that are not disclosed or suggested by Zwilling and Hitz, individually or in combination.

Specifically, for example, independent claim 1 as amended recites as follows:

1. A method comprising:
 locating blocks of data in a log that are referenced and within a range at a tail
   of the log, <u>the range representing an address range within an allocated
   segment of the log implemented in a hierarchical architecture having a
   plurality of storage trees, each representing a snapshot taken at a point
   in time of target data being processed, each storage tree having a
   plurality nodes and each node representing a segment of data of a
   snapshot associated with each storage tree</u>; and
 copying the blocks of data that are referenced by one or more other blocks of
   data of other nodes and within the range to an unallocated segment of
   the log, <u>wherein blocks of data that are not referenced by other blocks
   of data and within the range remain untouched</u>.

(Emphasis added)

Independent claim 1 requires locating blocks of data within a log which is

implemented in a specific hierarchical structure having multiple storage trees, each representing a snapshot taken at a point in time of target data to be processed (e.g., backup). Each node represents a segment of the snapshot. The blocks of data that are referenced by others may be copied to another unallocated location while the unreferenced blocks are untouched. As a result, after the copying, the allocated range that was used to store the copied blocks can be released. It is respectfully submitted that the above limitations are absent from Zwilling and Hitz, individually or in combination.

Although Zwilling is related to online file shrink facility, Zwilling still fails to disclose the specific data hierarchical architecture set forth above. In order to render a claim obvious, each and every limitation of the claims must be taught by the cited references, individually or in combination.

It is respectfully submitted that Applicant is not merely claiming garbage collection operations. Rather, the present invention as claimed is related to "how" to perform the garbage collection operations. It is respectfully submitted that Zwilling fails to disclose or suggest the limitations set forth above and the above limitations are not obvious by one with ordinary skill in the art at the time the present invention as claimed was made. It is respectfully submitted that Hitz also fails to disclose or suggest the limitations set forth above.

Similarly, independent claims 20 and 33 include limitations similar to those recited in claim 1. Thus, for the reasons similar to those discussed above, it is respectfully submitted that claims 20 and 33 are patentable over Zwilling and/or Hitz.

With respect to independent claims 8, 27, and 40, independent claim 8, for example, recites as follows:

8.   A method comprising:

garbage collecting within a range of addresses in <u>a storage system having a plurality of storage trees having multiple references to the same block of data</u>, the garbage collecting including
pruning walking of the plurality of storage trees to <u>determine active blocks of data within said range, where active blocks of data are those still in one of the plurality of storage trees</u>, the pruning walking including
determining, <u>based on accessing in one of said plurality of storage trees a parent node that has a plurality of descendent nodes, that none of the plurality of descendant nodes are associated with blocks of data within the range</u>; and
skipping the walking of the plurality of descendent nodes based on said determining.

(Emphasis added)

Independent claim 8 requires a specific storage tree and a specific way to pruning walk the storage tree to determine in a specific way whether certain blocks of data are active, as indicated above. It is respectfully submitted that the above limitations are absent from Zwilling and/or Hitz.

Although the Examiner acknowledged that Zwilling teaches different limitations (see, e.g., 2/9/2006 Office Action, page 10); nevertheless, the Examiner maintained that it is obvious to one with ordinary skill in the art, based on the teachings of Zwilling, would have arrived the present invention as claimed. Applicant respectfully disagrees.

Again, in order to render a claim obvious, each and every limitation of the claims must be taught by the cited references, individually or in combination. It is respectfully submitted that the above limitations are not obvious to one with ordinary skill in the art, specifically, at the time when the present invention as claimed was made.

Such an obvious suggestion can only be found based on the impermissible hindsight of the Applicant's own disclosure. Therefore, for the reasons set forth above, it is respectfully submitted that independent claim 8 is patentable over Zwilling and/or Hitz.

Similarly, independent claims 27 and 40 include limitations similar to those recited in claim 8. Thus, for the reasons similar to those discussed above, it is respectfully submitted that claims 27 and 40 are patentable over Zwilling and/or Hitz.

With respect to independent claims 15, 31, and 47, independent claim 15, for example, recites as follows:

> 15.   A method comprising:
>   performing following operations until each block of data that is active in a
>   range to be cleaned at a tail of a log of data is copied to a head of the
>   log, wherein a block of data is associated with a node of a storage tree,
>   the operations including
>   copying blocks of data associated with <u>child nodes of a current node
>   that are within the range to be cleaned</u> to the head of the log;
>   retrieving a block of data associated with the current node, <u>upon
>   determining that a minimum address value among addresses of
>   descendent nodes is within the range to be cleaned</u>;
>   designating, <u>as the current node, one of the child nodes of the current
>   node that is an interior node, upon determining that at least one
>   child node is an interior node</u>; and
>   designating, <u>as the current node, an ancestor node of the current node
>   whose descendent nodes are unprocessed</u>.

(Emphasis added)

Independent claim 8 requires a specific storage tree and a specific way to defining certain nodes within a storage tree. It is respectfully submitted that the above limitations are absent from Zwilling and/or Hitz.

Although the Examiner acknowledged that Zwilling teaches different limitations (see, e.g., 2/9/2006 Office Action, page 13); nevertheless, the Examiner maintained that it is obvious to one with ordinary skill in the art, based on the teachings of Zwilling, would have arrived the present invention as claimed. Applicant respectfully disagrees.

Again, in order to render a claim obvious, each and every limitation of the claims must be taught by the cited references, individually or in combination. It is respectfully submitted that the above limitations are not obvious to one with ordinary skill in the art, specifically, at

the time when the present invention as claimed was made.

Such an obvious suggestion can only be found based on the impermissible hindsight of the Applicant's own disclosure. Therefore, for the reasons set forth above, it is respectfully submitted that independent claim 8 is patentable over Zwilling and/or Hitz.

Similarly, independent claims 31 and 47 include limitations similar to those recited in claim 15. Thus, for the reasons similar to those discussed above, it is respectfully submitted that claims 31 and 47 are patentable over Zwilling and/or Hitz.

Given that the rest of the claims depend from one of the above independent claims, for the reasons similar to those discussed above, it is respectfully submitted that the rest of the claims are also patentable over Zwilling and/or Hitz. Withdrawal of the rejections is respectfully requested.
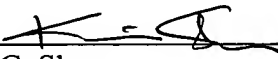
CONCLUSION

In view of the foregoing, Applicant respectfully submits the present application is now in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call the undersigned attorney at (408) 720-8300.

Please charge Deposit Account No. 02-2666 for any shortage of fees in connection with this response.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Date: _____ May 9, 2006 _____   _____

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